

Inventors: Yoav Bar-Yakov et al.

Serial No.: 10/541,668

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants: Yoav Bar-Yakov, Timothy Geran

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Examiner: Megan McCulley

For: FLAME-RETARDANT FOR ENGINEERING
THERMOPLASTIC APPLICATIONS

Attorney Docket: 0-05-109

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Commissioner for Patents

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Sir:

DECLARATION OF YOAV BAR-YAKOV

I hereby declare as follows:

1. I have been employed by Bromine Compounds Ltd. since July 1993. My current position is Head of the Plastic Applications Laboratory.
2. I am one of the co-inventors and co-applicants of the above identified application and I am familiar with the prosecution of this case. I have reviewed the Office Action issued on 27 July 2010 in this case, as well as the publications cited therein, including US 5,250,590 (Nakai et al.) and JP 2001-310990 (Nantaku et al.).

3. I wish to evoke the beginning of our development efforts in this project. As persons working in the field know, the brominated epoxy resins, whether purchased or home-made, contain residual organic solvents, usually ketonic solvents. When developing the product claimed in the present patent application, we tried to get rid of the residual solvents, and it surprised us how costly and time-consuming it was to lower the solvent contents in the high molecular weight epoxy resins. However, another surprising finding kept us motivated in our attempts to dry the resin: we found that even trace amounts of the solvents in the final product substantially changed its processing behavior, including melt flow. These two, rather incidental, findings led us to the present technology. We finally dried the raw materials and then reacted them in the absence of unwanted solvents.
4. In the mentioned Office Action, the Examiner suggests that Nakai et al shows the same composition as provided by our invention. However, as the Examiner herself noticed, Nakai et al. never remove any solvent during their production process, and therefore, their materials inherently comprise residual solvents. The solvent amounts may be apparently very low, but even the 99.95% pure materials will not provide brominated epoxy resins exhibiting our superior processing behavior, because residual solvents as low as 500 ppm substantially affect the resin properties. As shown in our Example 4, our resins enable easy processing, for example, during compounding operations. Moreover, our brominated epoxy resins positively influence even the polymeric composition which is flame retarded by them, for example, during injection molding, because our low-solvent resins unexpectedly increase the melt flow index of the compositions. Before observing the phenomenon, I would not have

expected that to happen, as my intuition would have directed me to believe that less residual solvent would increase the viscosity of the composition.

5. The Examiner suggests that it would have been obvious to a person having ordinary skill in the field to take a low molecular weight epoxy resin of Nantaku et al. and use it in the process of Nakai et al. I think that this hypothesis overlooks the fact that Nakai et al. did not wish to use low molecular weight epoxy resins at all, because their problem was poor heat stability and processability of retarded mixtures, and they found a solution for their problem by admixing polycarbonates to the existing epoxy resins -- adding another component solved their problem without touching the molecular weight issues. I, as a person working in this field, would not have considered the Nantaku's technique, because they always use solvents, of which we tried to get rid during our development work.
6. The Examiner notes that there is no evidence that Nantaku et al. do not manage to remove the residual solvent in their final product down to the level we reach in our epoxy resin. I studied the English translation of Nantaku et al., and I believe that they worked with similar composition, from the viewpoint of drying requirements, as we in our development experiments. This is corroborated by the examiner who observed that Nantaku et al. teach similar composition. Our Example 3 shows how difficult it is to remove, for example, dioxane from a brominated epoxy resin, and even after the whole day effort, comprising a temperature as high as 200°C and a pressure as low as 4 mm Hg, there was still 20 times more solvent than claimed in our invention. I can say that Nantaku et al. would not have inspired me to dry the product up to the level of 99.8% resin content, leaving the residual solvent at a level lower than 200 ppm. They mention very cursorily the drying step and obviously do not involve any special procedures; their drying conditions were much milder than we

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used in our Example 3. Based on my experience, and on the information I learned from Nantaku et al., I believe that their product contained much more solvent than our product.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made herein on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the subject application or any patent issuing thereon.

Dated 27.12.10

Yoav Bar-Yakov

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